Security system comprising light-conducting means

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Abstract of **EP0817148**

In a surveillance system comprising motion detection means, said motion detection means are secured by means of a security system comprising a light emitter and light-conducting which are optically coupled to said light emitter, which light-conducting means are for example provided along the circumference of a window, behind which said motion detection means are disposed. In this manner the window is secured against being damaged or against attack on its integrity, for example in the form of a film covering the window being sprayed on said window. The security system delivers an alarm signal when the intensity level is too low or too high.

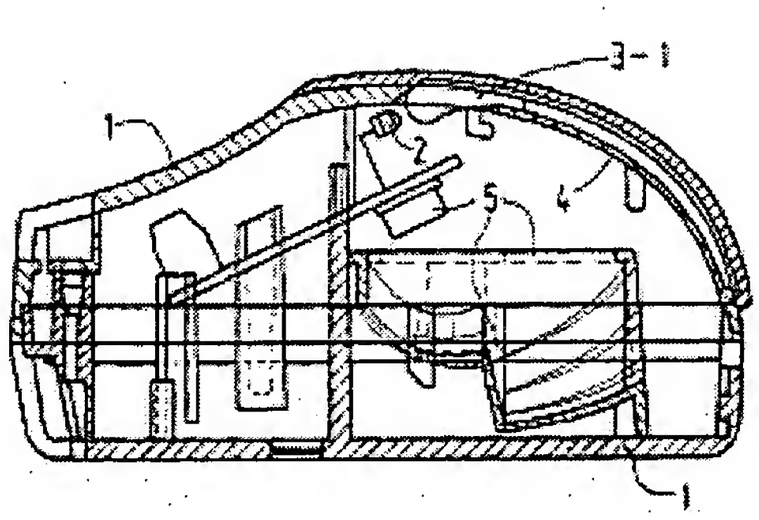

FIG.2

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(54) Security system comprising light-conducting means

(57) In a surveillance system comprising motion detection means, said motion detection means are secured by means of a security system comprising a light emitter and light-conducting which are optically coupled to said light emitter, which light-conducting means are for example provided along the circumference of a window, behind which said motion detection means are disposed. In this manner the window is secured against being damaged or against attack on its integrity, for example in the form of a film covering the window being sprayed on said window. The security system delivers an alarm signal when the intensity level is too low or too high.

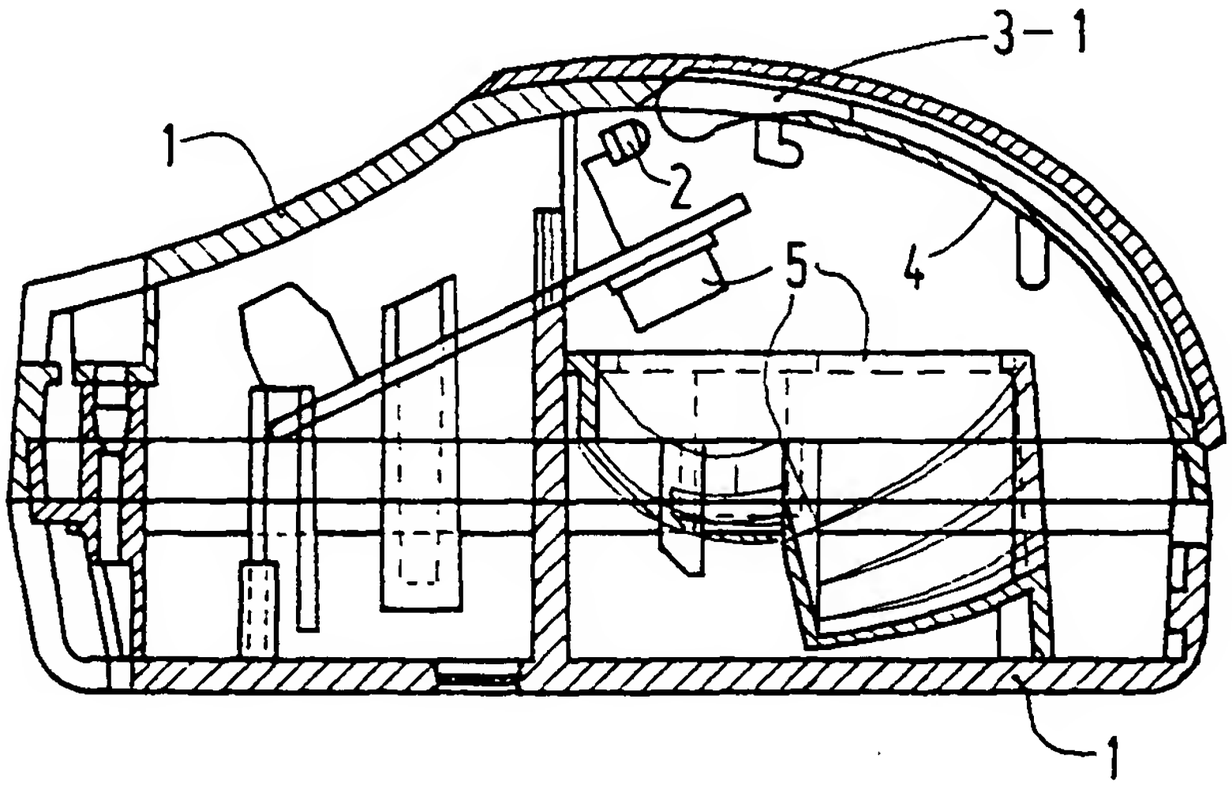

FIG.2

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Description

The present invention relates to a security system comprising a light emitter and light beam-producing means which are optically coupled to said light emitter.

Security systems of this kind form part of for example a surveillance system, which moreover comprises movement detection means for detecting the presence of objects, such as living beings, in a selected area.

A security system of the above type is known from EP-A-0 556 898, which describes a surveillance system comprising a motion detector which is placed behind a window which transmits electromagnetic waves. The window is thereby protected from being approached, masked or damaged by means of such a security system. To that end the security system includes a light emitter, light beam-producing means provided outside the window in the shape of two wings positioned in front of the window, as well as an light receiver, which detects at least a part reflected by the wings of the light emitted by the light emitter. When an object approaches the window, this leads to a significant increase or decrease of the amount of light being detected by the light receiver, and an alarm is given.

In practice it has become apparent, however, that the known security system is not in all cases sufficiently equipped for adequately guaranteeing the integrity of the system as a whole.

The object of the present invention is to provide a security system which provides a greater degree of security against whatever form of sabotage or attack on the integrity in a larger number of cases.

In order to accomplish that objective the security system according to the invention is characterized in that said light beam-producing means comprise light-conducting means.

The advantage of using light-conducting means in the security system according to the invention is that it provides a better possibility of protecting areas of more complex shapes, such as a window, which may even be curved, against intruders. This leads to a greater flexibility as regards possible uses. In addition to that the invention provides greater design possibilities, with the design less than before being determined by the technical function that must be performed. Furthermore it is possible to configure the security system according to the invention in such a manner that it will have greater appeal for the public at large and be accepted more readily by said public, whilst in addition to that an wider range of functional technical possibilities is created and higher specification requirements can be met, since it is moreover relatively easy to create various types of light beams at minimal losses in the light-conducting means. Furthermore it is possible to shape said light beams, in particular in such a manner that influences from the environment, such as ambient light, have a minimal influence on the operation of the security system.

The present invention and its further concomitant advantages will now be explained with reference to the accompanying drawing, wherein like numerals refer to like components in the various Figures of the drawing. In the drawing:

Figure 1 is a plan view of a possible embodiment of the security system according to the invention;

Figure 2 is a cross-sectional view along line II-II of the embodiment shown in Figure 1;

Figure 3 is a sectional view along line III-III of the embodiment shown in Figure 1;

Figure 4 shows a detail of the manner in which the output means shown in Figure 3 taper off into a point;

Figure 5 shows a detail of the light-output means provided with reflectors, as shown in Figure 1;

Figure 6 is a side view of the output means of Figure 5;

Figure 7 shows a further possible embodiment of the security system according to the invention as used in an embodiment which is intended for being mounted on the ceiling; and

Figure 8 is a schematic representation of the manner in which an air prism is used in the embodiment of Figure 7.

Figures 1, 2 and 3 are a schematic plan view, a cross-sectional view along line II-II and a cross-sectional view along line III-III respectively of the illustration shown in Figure 1 of a possible embodiment of a security system. The security system, which is accommodated in a housing 1 of a surveillance system for spaces, for example, comprises a light emitter 2 and light beam-producing means configured with light-conducting means 3, which are optically coupled to said light emitter 2. Light emitter 2 emits electromagnetic rays in the form of light which may or may not be visible, for example infrared light, in the direction of said light-conducting means 3. In the shown embodiment said light-conducting means are in the form of a system of light conductors 3-1, 3-2, whereby light emitter 2 is optically coupled to light conductor 3-1, in which said light propagates, whilst light conductor 3-2 is optically coupled to a light receiver (not shown). The specific shape of the light transmitting means 3, which is yet to be explained in more detail, results in a light beam being built up above a light transmitting window 4, which light beam has a shaped such that if an attempt is made to approach the window with an object, a change in intensity will be detected on the side of the light receiver (photodiode) as a result of the light reflecting from sad object, such that said light re-

ceiver will activate an alarm. Thus it is possible to detect any attempt to approach the window, damage it or cover it, for example by means of a substance such as a spray.

Present behind the light-transmitting window 4 are, usually very sensitive, motion detection means 5 which are schematically represented in Figure 2, which means are capable of detecting movements of objects as a whole, both near the surveillance system and at a large distance therefrom. Said motion detection means 5 also comprise, in a manner which is known per se, one or more light receivers (not shown) (housing 1 is mirror symmetrical in the sense that line II-II in Figure 1 is the axis of rotation; light emitter 2 is positioned in the immediate vicinity of light-conducting means 3-1, whilst light receiver 2 is positioned near light-conducting means 3-2). Means 5 are activated at a certain stage and in that case will be capable of generating an alarm when an intruder enters the location where the surveillance system is installed. Preferably, however, the security system comprising the light-conducting means 3 will be permanently operative in order to detect any attempt to approach the surveillance system comprising means 5, no matter whether it is day or night.

In the illustrated embodiment the solid angle within which motion detection means 5 are capable of detecting a movement made by an object will at least partially cross the light-transmitting window 4 being secured by the security system. In order words, joint use is made of motion detection means 5 present at window 4 and the security system protecting window 4. This provides additional security against any undesirable masking or covering of window 4, in which case the motion detection means would not be capable of detecting a movement made by an object. Thus motion detection means 5 are prevented from being blinded entirely or partially. Figure 3 in particular shows that light-conducting means 3-1 and 3-2 are positioned beside or at least partially around light-transmitting window 4, which is thus fully covered by the local light beam emitted from light-conducting means 3.

Use is made of several reflection surfaces 6 provided in light-conducting means 3. In the illustrated embodiment said reflection surfaces are provided in a knurled pattern of internal reflection surfaces 6, as is shown in detail in Figure 5, which internally reflect the light beamed into light-conducting means 3 by light emitter 2. In Figures 4 and 5 said internal reflection pattern is indicated at A. In a direction towards window 4 said light-conducting means 3 comprise light-output means, which terminate in a point 7 (called "launcher", in the sense that photons are received and/or emitted in the correct amounts in various well-defined directions). Said point 7 is preferably configured so as to cause refraction, as a result of which a desired light beam is generated just outside window 4. In the embodiment of the light-output means 7 shown in Figure 4 an internal reflection has been obtained by means of a two-surface configuration, with a first surface 8 inclined at an angle α, such that a first light beam B is produced after refraction by a second surface 9, which is inclined at an angle β. When it applies that α is approximately 39° and β is approximately 15°, light beam B includes an angle of approximately 60° with the horizontal. As a result of the presence of the various reflection surfaces 6 that are shown, such a light beam B is generated over the entire width of window 4. In the illustrated embodiment the specific selection of the aforesaid angles α and β and the irradiation of light-conducting means 3 on the side of light emitter 2 moreover leads to a (very small) part (for example <1%) of the light rays in light-conducting means 3 crossing directly from light-conductor 3-1 to light-conductor 3-2, substantially parallel to window 4. This is the part indicated at C in Figure 3. Besides that a part indicated at D will reflect on window 4 and then be picked-up by light conductor 3-2. Where light beam B enables local protection of the surveillance system as a whole, light beam C offers security against window 4 being approached, and light beam D makes it possible to protect the outside surface of window 4 against being plastered or sprayed over. In such cases this leads to a change in the surface characteristics (texture) and in particular in the degree of reflection of the upper surface of window 4, which will call forth a situation on the side of optical receiver 3-2 where the minimum detection level to be received is not achieved, for example, as a consequence of which an alarm is generated. If on the other hand a maximum received intensity level is exceeded, an alarm will likewise be generated, of course, which situation will present itself when an object approaches window 4 too closely.

Another possible embodiment of the security system according to the invention is shown in Figure 7. This security system, which is suitable for being mounted on for example a wall or ceiling and which is capable of detection all round, if desired, is built up of circular light-conducting means 3-3, 3-4, between which window 4 is positioned. Where window 4 of the preceding embodiment is curved in one direction and is yet fully secured, window 4 of the embodiment shown in Figure 7 is curved in two directions, and the aforesaid light beams C and D will be left out by adapting the shape of point 7, if desired, in such a manner that the respective surfaces will only need to spark off the local formation of only light beam B. Light-transmitting window 4, behind which motion detection means 5 will be present, will be secured similarly to the preceding embodiment already described before.

Light beam B actually consists of an active beam from light emitter 2, which is emitted by light-conductors 3-1 (Figure 3) and 3-3 (Figure 7), whilst on the other hand a light sensitivity beam concentrates near light conductors 3-2 and 3-4. This light sensitivity beam actually marks the sensitivity to light being beamed in from a particular direction.

Figure 8 shows a specific manner in which light emitter 2 provides in particular light conductor 3-3 with

light. Optical emitter 2 beams light onto a lens 10, which is provided on light conductor 3-3. An air prism 11 is formed by providing two sloping surfaces at the bottom side, as a result of which a light beam E will propagate concentrically to the outside surface of light conductor 3-3 if the positions of the surfaces and the lens 10 are suitably selected, thus forming the exiting beam B that has already been explained before.

Said light-conducting means 3 are preferably made of polycarbonate , PMMA (polymethyl methacrylate), PET (polyethylene teraphthalate), possibly PVC (polyvinyl chloride), which is relatively easy to process and which exhibits low light-absorption, which leads to a high light output at a given power output from light emitter 2.

Of course variations to in particular the shape of the light-conducting means 3 themselves and the shape of the various light beams being formed are possible within the framework presented herein. Furthermore mirror surfaces, refraction surfaces or refraction index profiles may be added to or be combined with the light-conducting means 3 transporting the light internally in order to form the desired light beam.

Claims

1. A security system comprising a light emitter and light beam-producing means which are optically coupled to said light emitter, characterized in that said light beam-producing means comprise light-conducting means.

2. A security system according to claim 1 comprising motion detection means, wherein the light beam at least partially crosses the solid angle within which said motion detection are capable of detecting movement.

3. A security system according to claim 2, wherein said motion detection means are placed behind a light-transmitting window, and wherein said light-conducting means are at least partially positioned beside said light-transmitting window for forming said light beam at said window.

4. A security system according to claim 3, wherein said light-conducting means are at least partially positioned around said light-transmitting window.

5. A security system according to claim 3 or 4, wherein said light-conducting means are at least partially positioned in front of said light-transmitting window.

6. A security system according to any one of the claims 1 - 5, wherein said light-conducting means are curved in order to be capable of securing a window possibly having a curved configuration.

7. A security system according to any one of the claims 1 - 6, wherein said light-conducting means are in the shape of a system of light conductors mounted on said light-transmitting window.

8. A security system according to claim 7, wherein said light conductors are each other's mirror image, or rectilinear of concentric.

9. A security system according to any one of the claims 1 - 8, wherein said light-conducting means are provided with light-output means for forming at least one substantially forward light beam.

10. A security system according to claim 9, wherein said light-output means are made up of reflectors provided in said light-conducting means.

11. A security system according to claim 10, wherein said reflectors are reflection surfaces provided one behind the other in the interior of said light-conducting means.

12. A security system according to any one of the claims 9 - 11, wherein said light-output means are shaped such that a singly or multiply/continuously refracted (diffuse) light beam extending in (a) desired directions is formed.

13. A security system according to claim 13, wherein said light-output means taper off into a point, whose abutting surfaces form one or more internal reflection surfaces being inclined at (a) certain angle(s) for giving the light beam(s) being put out their desired configuration.

14. A security system according to any one of the claims 1 - 13, wherein said light-conducting means are made of polycarbonate , PMMA (polymethyl methacrylate), PET (polyethylene teraphthalate), or PVC (polyvinyl chloride).

15. A security system according to any one of the claims 1 - 14, wherein said light-conducting means comprise an air prism.

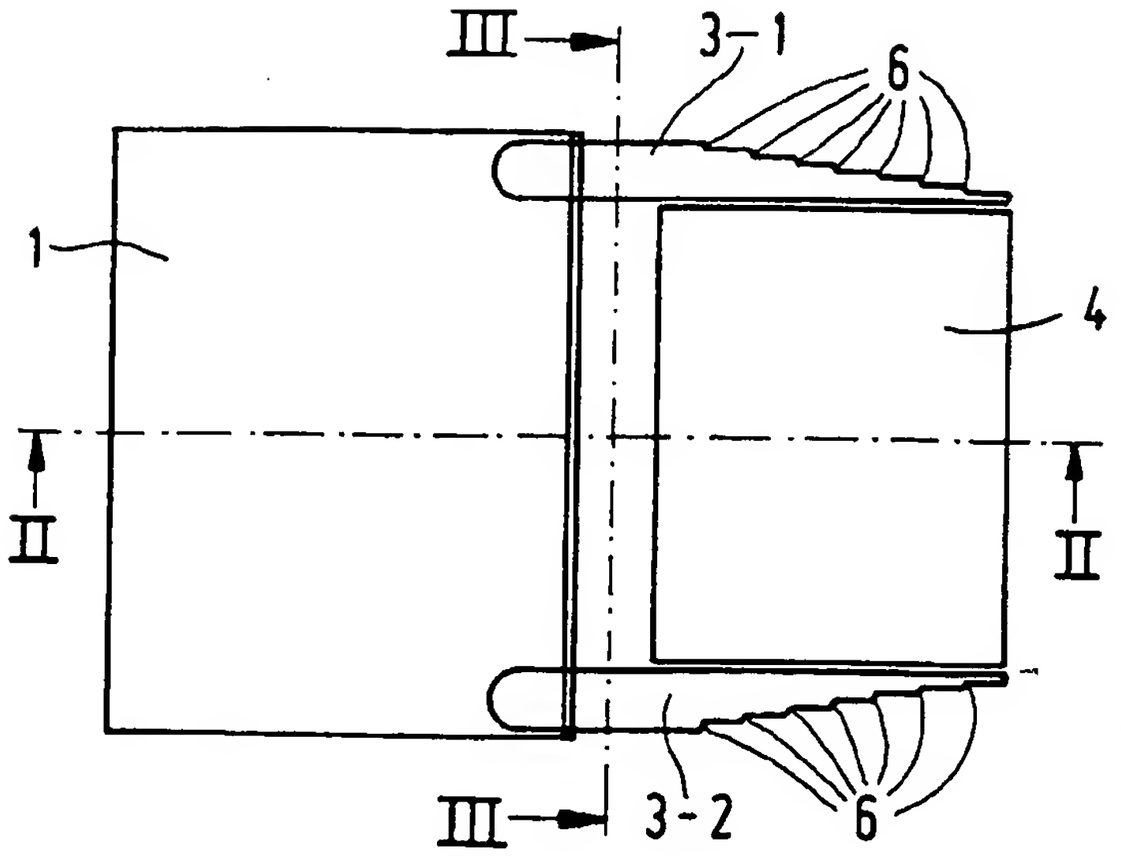

FIG. 1

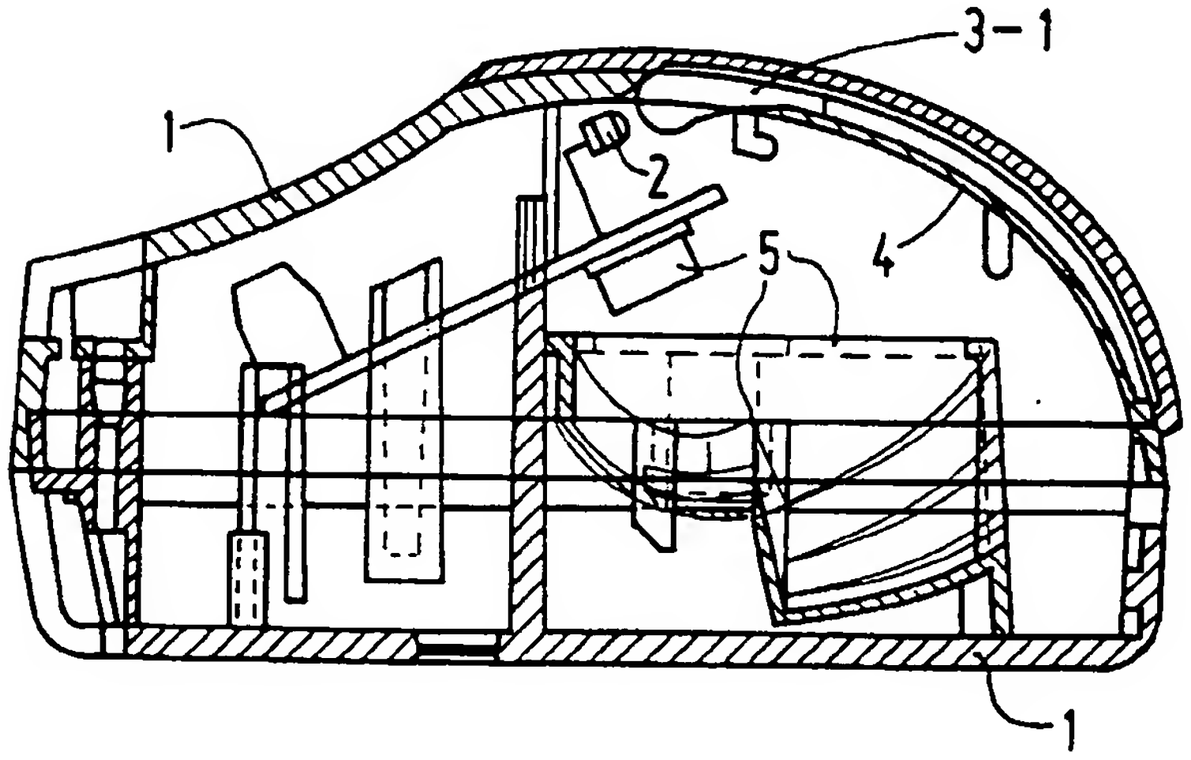

FIG. 2

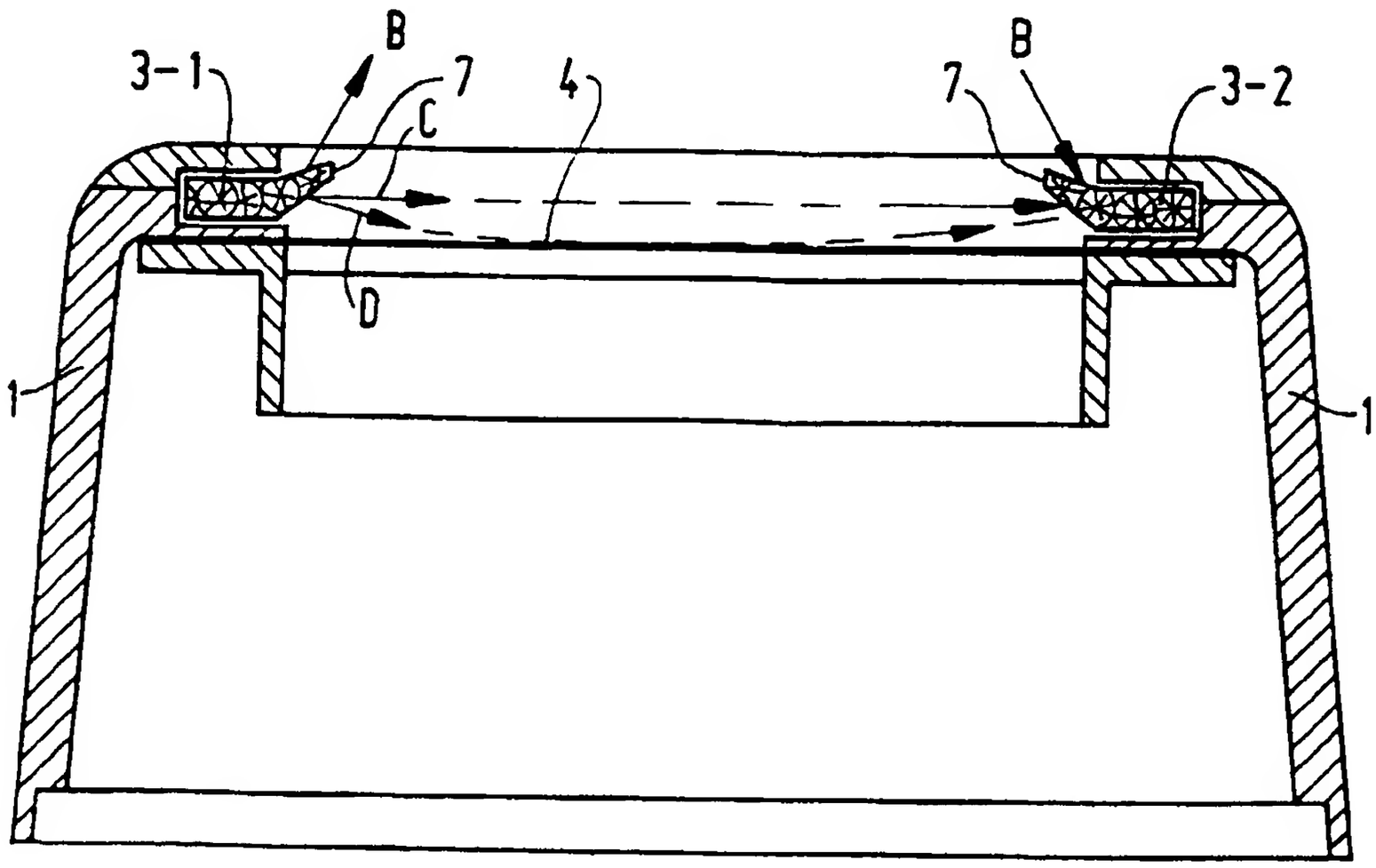

FIG. 3

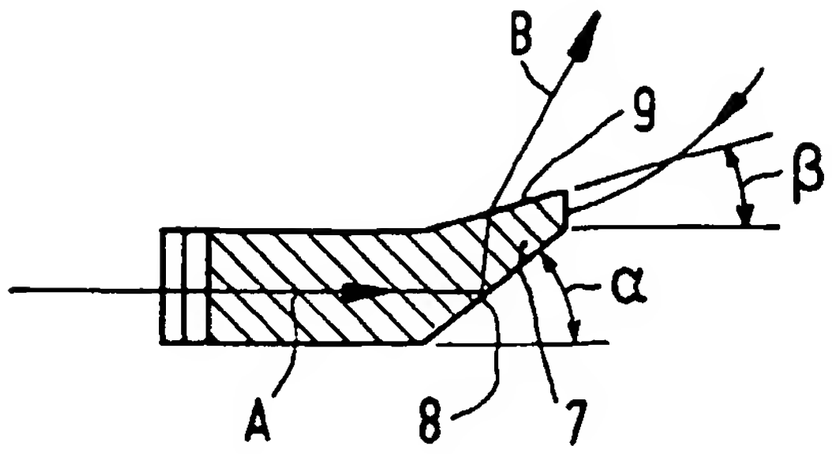

FIG. 4

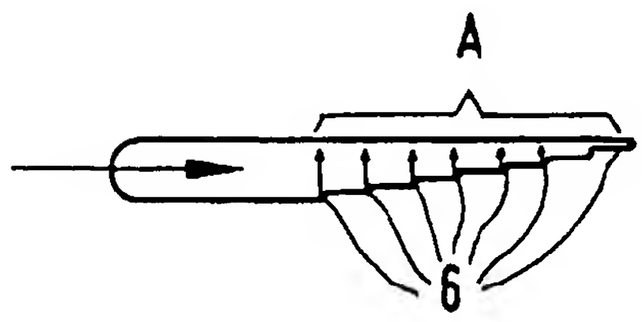

FIG. 5

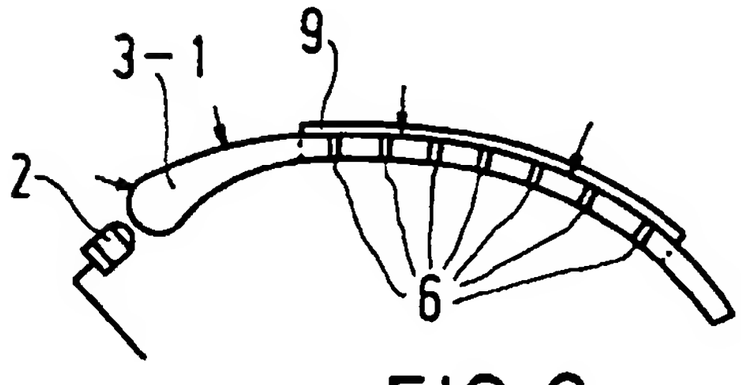

FIG. 6

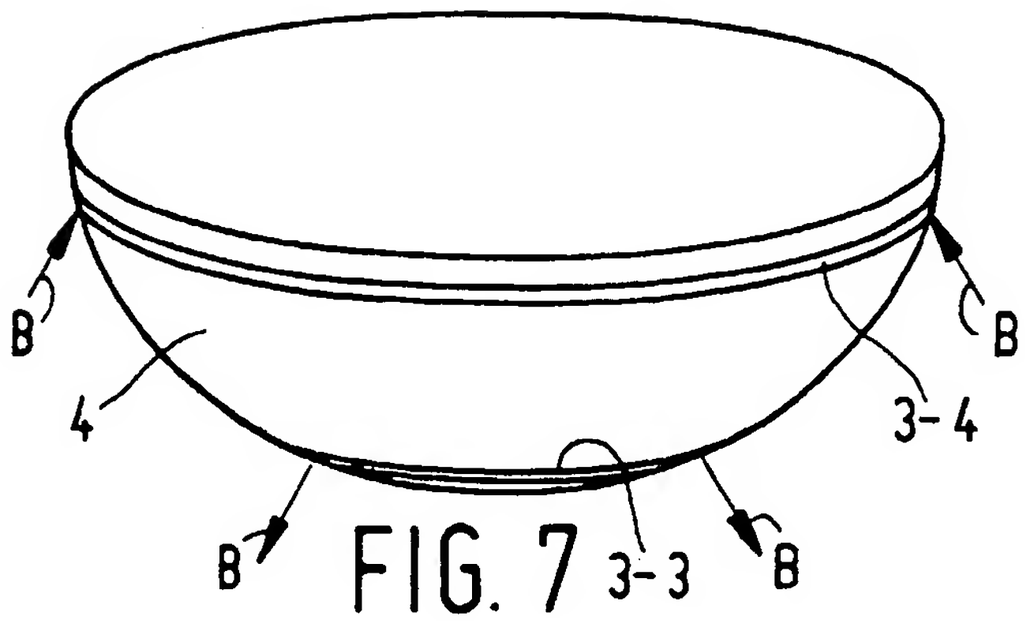

FIG. 7

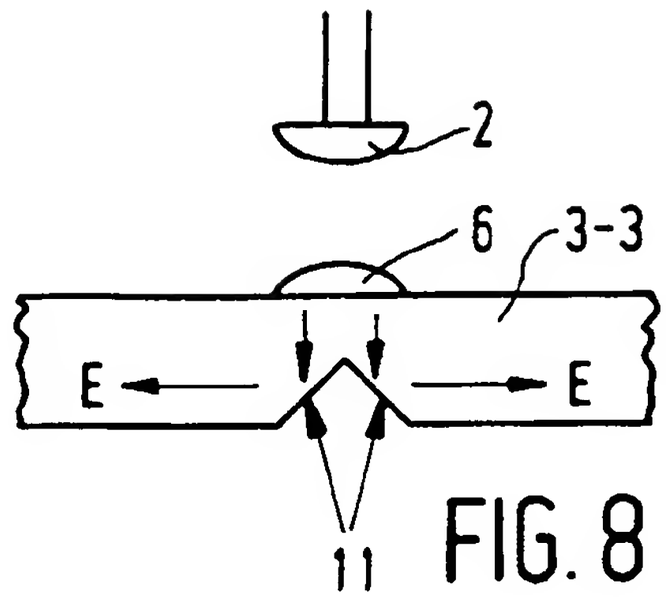

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 20 2063

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 96 06865 A (ZHEVELEV B.) 7 March 1996 * abstract; figures 1-12 *	1-3	G08B29/04
A	EP 0 660 284 A (IMURO Y.) 28 June 1995 * abstract; figures 1-5,8 *	1-3	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

G08B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 October 1997	Sgura, S

CATEGORY OF CITED DOCUMENTS

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